DOCUMENT RESUME

ED 366 314 IR 016 510

| | |
|---|---|
| TITLE | OBN (Open Library Network) Final Report: From Project to Library User. |
| INSTITUTION | Pica, Leiden (Netherlands).; SURFnet (Netherlands). |
| SPONS AGENCY | SURF Foundation, Utrecht (Netherlands). |
| REPORT NO | ISBN-90-70311-43-7 |
| PUB DATE | 92 |
| NOTE | 52p.; OBN = Open Bibliotheek Network. |
| PUB TYPE | Reports - Evaluative/Feasibility (142) |
| EDRS PRICE | MF01/PC03 Plus Postage. |
| DESCRIPTORS | Access to Information; Delivery Systems; Foreign Countries; *Integrated Library Systems; *Library Automation; Library Catalogs; Library Services; *Networks; *Online Catalogs; Online Searching; Program Implementation; *Technological Advancement; *User Needs (Information) |
| IDENTIFIERS | Netherlands; *Open Library Network (Netherlands) |

ABSTRACT

The Open Library Network (OBN) is intended to connect national and local university library systems in the Netherlands. OBN integrates existing automated library systems and procedures and brings services like catalog searching and document delivery to the desk of the library user. Project results can be grouped into four categories: (1) the new system; (2) the new online catalog; (3) the national network of online public access catalogs; and (4) the central gateway functions. The project is being carried out by the Pica Center for Library Automation. In the last few years the SURFnet network has provided advanced network infrastructure in the Netherlands. The OBN combines the efforts of the Pica Center with those of SURFnet. With technically advanced network services, the OBN will set the library user in the center of services with seamless access to catalogs and databases. Improvement and introduction of new services are planned, based on user evaluation. The new activities and services should, within the next few years, establish a system for fast mutual document delivery. Eight figures and four tables illustrate network operation and features. (SLD)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

SURF

Pleat SURFnet

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

ED 366 314

*from*

# OBN final report

*project to*

*library user*

120 16 510

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

D. Hooman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

# OBN final report

*from project to library users*

CIP-DATA ROYAL LIBRARY, THE HAGUE

OBN
OBN final report: from project to library users / Stichting Centrum voor Bibliotheekautomatisering Pica, Surfnet.
's-Gravenhage: Stichting Centrum voor Bibliotheekautomatisering Pica. III
ISBN 90-70311-43-7
Trefwoord: bibliotheeknetwerken

Editorial/production supervision: Stichting Pica
Design: 2D3D (Paul Golembiewski) , The Hague
Printed by van Rossum BV, Utrecht

© 1992 by Pica/SURFnet
Leiden/Utrecht, The Netherlands
All rights reserved. No part of this book may be reproduced, in any form or by no means, without permission in writing from the publisher.
Printed in The Netherlands

# *Preface*

It took two and a half years to bring the project to the users. In this period, SURFnet bv and Pica joined forces to build the Open Library Network (OBN). Today, the first libraries use this unique infrastructure and in my opinion many others will follow. With their workstation connected to OBN, library employees can access the local and central Pica systems. These new-developed systems are very user-friendly. With their increased functionality they offer improved services to library users.
Through OBN, library users get a variety of information stored in catalogues and information services on their desktop. Borrowing, reserving and renewing the loan of publications in their 'own' library, but in principle also in other libraries connected to OBN: the library user gets the opportunity to do it all by himself.
OBN brings the library to the users, a library, as a distribution centre of information, prepared for the future.
With OBN, higher education and scientific research have got a useful addition to the services SURFnet has to offer.

Ir. G.J. van de Graaf
Managing director SURF Foundation.

# *Management summary*

1 The Open Library Network (OBN) intends to realize the interconnection between national and local (university) library systems in the Netherlands. OBN integrates existing automated library systems, library networks and library procedures. OBN brings services like catalogue searching and document delivery to the office-desk of the library user.

2 The OBN project is the first technical step to realize the OBN concept. Implementation of the full concept will take several years to come. Full implementation depends on budgets and on the continuity of library services for the library user.

Implementation starts with the Pica-libraries that already use Pica-developed Local Library Systems (LBS). The results can be applied to other Dutch libraries with library systems supplied by commercial vendors and using the central Pica facilities for cataloguing and interlibrary loan. Pica will support those libraries, as far as possible.

3 The following objectives were pursued during the OBN-project:
- the development of a new online public access catalogue
- the development of standardized networking facilities between Pica and library systems
- introduction of the concept of integrated cataloguing
- the integration of Picamail into Surfmail.

4 The results of the project can be grouped into four categories:
- the new system
- the new online catalogue
- the national network of OPACs
- the central gateway functions.

5 For libraries and library staff, OBN will improve the quality of library services because the existing facilities are integrated. OBN creates possibilities for improvement of services and for the development of new services to library users. OBN creates cooperation between libraries for tuning the services, which will be more efficient, faster and guaranteed. Improvement of coordinated resource sharing will create opportunities for new library policies.

6 With technical advanced network services, OBN will set the library user in the centre of library services. Seamless access will be created to catalogues and databases of the own library and of other libraries. In the near future, those facilites will be improved, based on user evaluation. Furthermore, the introduction of new services has been planned.

7 After full implementation of OBN, the library user will have the following facilities:
- searching through the user's own library catalogues and files
- borrowing, reserving and renewing the loan of publications from the own library
- searching through catalogues and files belonging to other libraries participating in OBN
- requesting publications from these other libraries' stock
- searching through Pica's central online retrieval databases
- printing and downloading of information, resulting from the above mentioned operations.

In due course, three additional facilities will be realized
- searching in Pica's National Union Catalogue
- requesting publications via the National Union Catalogue
- electronic delivery of documents.

8 In order to serve the library user effectively with OBN-products, the cooperating participating libraries have to adapt their services.

9 The new online catalogue has been evaluated in a large scale study by the Royal Library and the University Library of Groningen.

10 The OBN-project was carried out by Pica Centre for Library Automation, while the SURF Foundation sponsered the project through SURFnet bv.
The grand total of project-costs is f 3.825.752,- (incl. V.A.T.).
Of these costs, SURFnet paid f 3.228.483 and Pica f 597.269,-.

# *Table of contents*


PREFACE *3*

MANAGEMENT SUMMARY *5*

1 OPEN LIBRARY NETWORK: *The concept* *9*

2 OPEN LIBRARY NETWORK: *The project* *17*

3 OPEN LIBRARY NETWORK: *The results* *23*

4 OPEN LIBRARY NETWORK: *The libraries* *37*

5 OPEN LIBRARY NETWORK: *The library user* *39*

6 OPEN LIBRARY NETWORK: *The future* *45*

7 FINANCES *49*

ABBREVIATIONS *52*

BEST COPY AVAILABLE

# 1 *The concept*

***The Open Library Network (OBN) intends to realize the interconnection between national and local (university) library systems in the Netherlands. OBN integrates existing automated library systems, library networks and library procedures. OBN brings services like catalogue searching and document delivery to the office-desk of the library user.***

OBN affects library users as well as library staff. OBN puts the library user in the centre of library services in an advanced way. Less than before, he will depend on the librarian's intermediary role. After authorization, the library user himself will get access to databases and library services with his own personal computer. The variety of facilities will be seamlessly integrated within an open, transparant network. As a first step, OBN is created to give the user access to the catalogue of his own library and of other libraries, independent of a librarian. Next steps will follow like loan facilities and document delivery. The library user will not even have to visit the library. For, through the Open Library Network, the library is coming to the user.

For libraries and library staff, OBN will improve the quality of library services because the existing facilities are integrated. OBN creates possibilities for improvement of services and for the development of new services to library users. OBN creates cooperation between libraries for tuning the services, which will be more efficient, faster and guaranteed. Improvement of coordinated resource sharing will create opportunities for new library policies.

The OBN project is the first technical step to realize the OBN concept. Implementation of the full concept will take several years to come. Full implementation depends on budgets and on the continuity of library services for the library user. The project was carried out by Pica Centre for Library Automation, while the SURF Foundation sponsored the project through SURFnet bv. The concept is supported by the major Dutch library organizations (Royal Library, university libraries, WSF-libraries, NBLC, RABIN).

Implementation starts with the Pica-libraries that already use Pica-developed Local Library Systems (LBS). The results can be applied to other Dutch libraries with library systems supplied by commercial vendors and using the central Pica facilities for cataloguing and interlibrary loan. Pica will support those libraries, as far as possible.

## PICA

Pica is a cooperative non-profit organization for libraries and other information providing institutions. Pica aims at *promoting cooperation* between libraries and other information providing institutions and at *optimizing the management* of the participating institutions through this cooperation.
Pica *wants to improve the services to library users* while promoting the efficiency of the Dutch library- and information system as a whole.
*Optimal access to information for the benefit of end-users is Pica's objective.*

Until now, Pica's products and services were directly related to the support of libraries. More or less independently from each other, libraries were serving their users with the developed products.

## PRODUCTS AND SERVICES

Over the years, the Pica technical infrastructure has been realized in an evolutionary fashion, keeping up with the requirements of libraries and library users on the one hand and with the technological and economic possibilities on the other hand:

- **1978-1981**
  The founding libraries (Royal Library and several university libraries) required a facility in order to support their cooperation in the area of cooperative cataloguing.
  *Products:* – shared cataloguing system (1979)
  – offline system for printed catalogue production (1980)
- **1982-1988**
  Strong growth of the use of the shared cataloguing system by all types of libraries for all kinds of library materials; more applications were called for and became available.
  *Products:* – interlibrary loan system for periodicals (1982)
  – acquisitions system (1983)
  – circulation control system (1983)
  – central online retrieval system (1985)
  – online public access catalogue (1985)
  – periodical control system (1987)
  – interlibrary loan system for monographs (1988)

## Network development

A decision was taken to make a division between central and local applications. Central applications were to be run on the central computersystems and local applications on local computersystems at each of the participating libraries.
Central applications are those applications (Shared Cataloguing, Interlibrary Loan, Online Retrieval) which are used in an identical version by all or many participating libraries and for which the associated data are largely shared data (e.g. bibliographic information, ILL requests).
Local applications are those applications (e.g. Circulation Control, OPAC) which are used by different libraries in slightly different versions and for which the associated data are largely of a local nature (e.g. patron-information, shelf-numbers).

*The growth of datacommunication networks, especially the academic research networks, throughout Europe is now empowering individuals and libraries with previously undreamed access to information.*

The local systems (LBS) were installed at the sites of member-libraries and communication was taken care of initially through magnetic tape transfer and later through an interconnection via leased telephone lines with the central system.

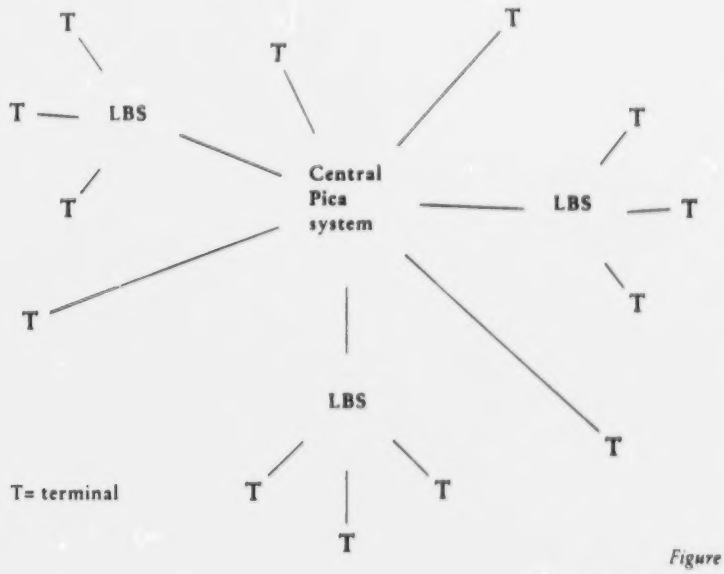



*Figure 1*
*Pica network, 1985*

For Pica-LBS-systems, initially the interconnection was especially required for the transfer of bibliographic data from the central Pica-database to LBS for use by applications such as Acquisitions and for building the local OPAC.

With different, non-Pica-developed Local Library systems, supplied by commercial vendors to major libraries, connections were established in different ways (e.g. magnetic tape transfer, experimental pre-OSI-links).

## Migration to SURFnet

After some time, the OPACs became heavily used and libraries wanted to offer more and higher quality enduser-services. For this reason, a situation would be preferred where each library system could communicate directly with the central Pica-system as well as with each of the other LBS-systems.

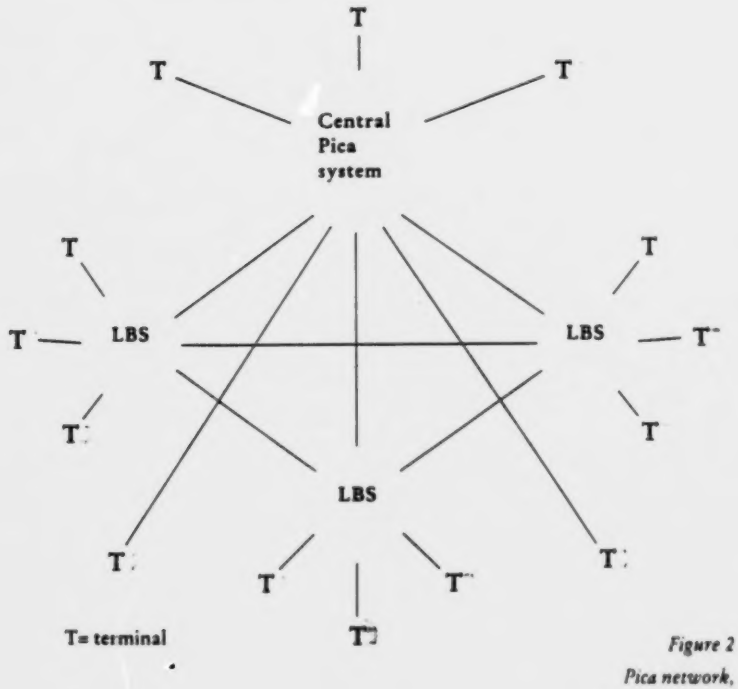



*Figure 2*
*Pica network,*
*functional design*

The large investments in network technology by the government and universities created completely changed circumstances in this field. The growth of datacommunication networks, especially the academic research networks, throughout Europe is now empowering individuals and libraries with previously undreamed access to information. During the last few years, SURFnet has developed an advanced network infrastructure in the Netherlands in order to encourage mutual communication and cooperation between researchers, to give them access to computing facilities, databases and to simular networks abroad.
So both Pica and SURFnet wished to administer a datacommunication network for roughly the same group of users.
In 1989 Pica decided to replace the leased line datacommunications infrastructure by the SURFnet packet switching network. SURFnet subsequently expanded its services towards libraries and library institutions.

## DATACOMMUNICATION INFRASTRUCTURE

With the further development of Local Area Networks in Pica's member institutions, a technical concept emerged. On the national level, the central Pica-system runs the central applications, associated to the central databases, whereas the participating libraries are interconnected through SURFnet. On the local level, the main library runs an LBS with local applications centered around the OPAC and the local database. On the faculty and/or individual level the library user as well as library staff are connected to the library computersystem through the (university) LAN and use either terminals or PC-based workstations for interaction.

During 1990-1992, the central Pica-system was connected to SURFnet and the approx. 350 libraries, using the central Pica-system for shared cataloguing, inter-library loan and/or online retrieval were migrated into SURFnet, too. During the same period, new interconnections with library networks abroad were conducted from the central Pica-system via SURFnet, especially with LASER (UK) and SDB/SUNIST (France) for the EC-experimental project for international interlibrary loan, with BLDSC, Boston Spa (UK) for international document delivery, and with the Niedersachsen network and the Deutsche Bibliothek in Germany. Niedersachsen and the Deutsche Bibliothek decided to implement the complete Pica-infrastructure in their organizations.



14

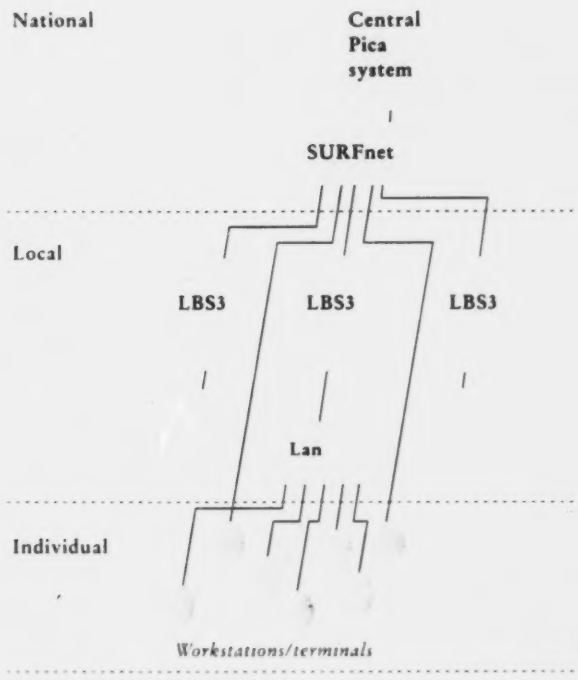



*Figure 3*
*Pica network, realization*

## Redesign of central and local systems

In order to use the new datacommunication infrastructure in an effective way, the existing systemdesigns of all Pica-applications needed to be re-evaluated. In 1989, it was decided to redesign all the applications and to adapt the software to the new situation.

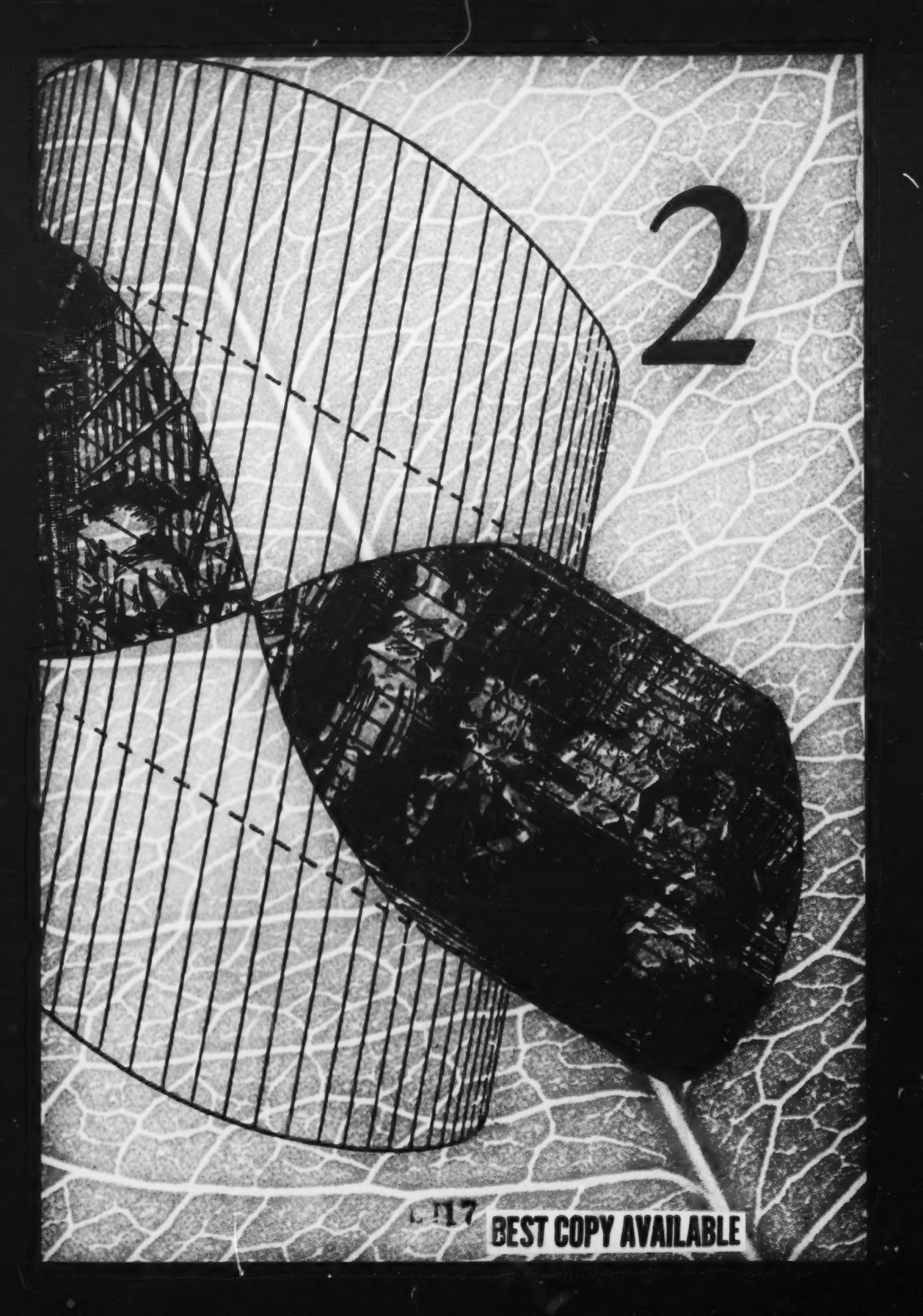
*Characteristics of the new developments are:*

- integration of software
- standardization of search facilities
- implementation of intelligent workstations (personal computers)
- standardization of datacommunication (ISO-VT)
- improvement of online public access
- integration of CD-technology.

The software development was finished in July, 1992. Most of the modules have been tested or will be tested during 1992 by two libraries, who were involved as test-sites for software development: the Royal Library, The Hague, and the University Library Groningen.



16




BEST COPY AVAILABLE

# 2 The project

## PROJECT OBJECTIVES

Through the OBN project, SURF, SURFnet and Pica want to achieve a common goal which is described in the project plan as 'the realization of a fully open library network, in which all users in universities and other institutions for higher education in principle can gain access to the central and local Pica library services...'.

*As a result, the functionality of all Pica systems, both central and local systems, is offered to library staff and library users through a single workstation.*

*To achieve this goal, the following objectives were pursued:*

- **The development of a new online public access catalogue (OPC3).**
  The experiences with the two previous versions in the years 1983-1990 have provided valuable information for the development of this new version of the Pica-OPC. A number of studies, among which a user survey and ergonomical research, have led to a more user-friendly interface and improved search facilites;
- **The development of standardized networking facilities between Pica library systems.**
  These facilities were created on the basis of standard products and ISO/OSI-protocols. As a result, the functionality of all Pica systems, both central and local systems, is offered to library staff and library users through a single workstation. These users can use the facilities as far as they have been authorized. Also, the library systems have been integrated in the local datacommunication infrastructure in the universities.
- **Introduction of the concept of integrated cataloguing.**
  A PC connected to the local library system can switch through this system and the SURFnet X.25-network to the central shared cataloguing system (GGC) at the Pica-office in Leiden. While the cataloguer is working online in the central database, a background process maintains a connection between the local and central system. The process downloads any description of material held in the library that the cataloguer has changed, and updates the local database with this information without human intervention.
- **The integration of Picamail into SURFmail.**
  The very heavily used electronic mail facility Picamail which is used between users of the central Pica-system is connected to external mail facilities. Library staff using the central Pica-system can now exchange electronic messages with



7118

colleagues in non-Pica libraries nationally and internationally, and can use other mail-based services offered through SURFnet.

## PROJECT ORGANIZATION

Based on a project plan, accepted by all participants in 1989, a project organization was set up:

*Figure 4*
*Project organization OBN*

Under responsibility of a Steering Committee, consisting of the directors of SURFnet and Pica and an appointed, independent advising university librarian, the project organization was set up in an effective way. In order to ensure a controlled and phased introduction of the produced software, two libraries were selected as testsites: the Royal Library and the University Library Groningen.

## PROJECT PHASES

The project plan divided the project in four phases. The names of the phases express the most important topics.

*The phases were:*

- **Design phase** (1 January - 1 August 1990):
  preparation of the actual specifications for the operating system, application software and networking protocols.
- **Development phase** (1 August 1990 - 1 February 1991):
  realization of the networking and application software, under a new RDBMS and under a new operating system.
- **Implementation phase** (1 February - 1 December 1991):
  the implementation in the test libraries of the OBN software, meanwhile introducing a new computer configuration; introduction of the applications to the users.
- **Demonstration phase** (1 December 1991 - 1 July 1992):
  announcement and demonstration of the project results to a wider group of libraries and other institutions; extension of the VT interlibrary connection and preparation of the connection of all Pica libraries to the network.

Each phase was guided by a phase plan, which was written by Pica and agreed to by SURFnet. For each specific phase, the phase plan was an in-depth elaboration of the overall project plan, thereby replacing it as the actual controlling document. Each phase was concluded by a phase report, and by approval of the results by SURFnet and SURF.

Apart from phase plans and phase reports, for each phase there was an accurate description of the deliverables that Pica had to present. Generally, these deliverables were software applications or written documents (design, specifications, documentation, reports).

Especially in the first year of the project, some technical decisions had to be made, which had an important impact on the total development of Pica's systems and services in the next decade.

*Pica introduced external expertise on two occasions:*

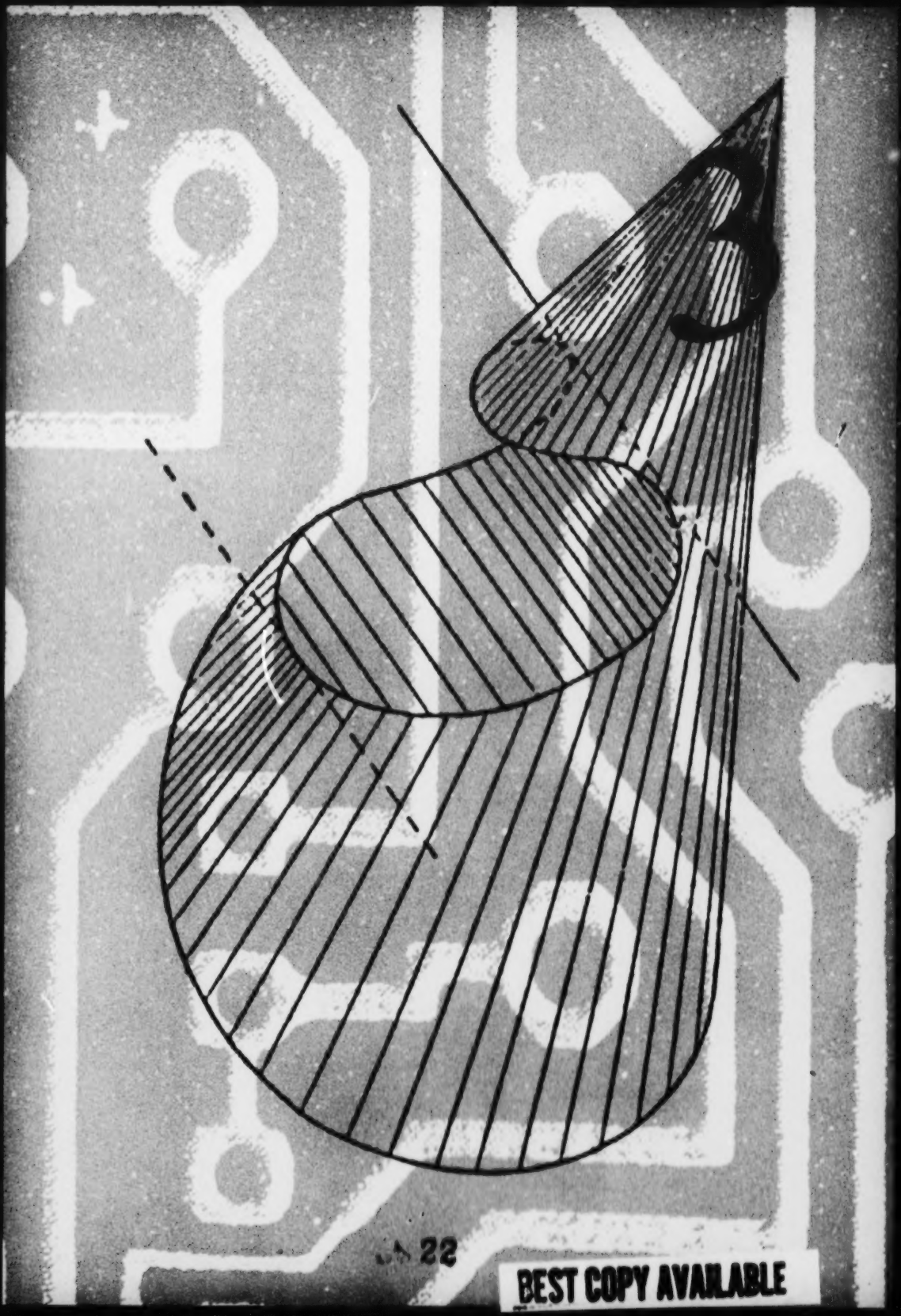
- **Database Benchmark**
  The crucially important choice of a new database system was accompanied by Logica, a specialized consultancy firm. Pica selected an RDBMS after a benchmark in which various packages were tested on different features.
- **Audit**
  The overall technical design of OBN was audited by S-COM, a firm dedicated to high-quality technological advice.

## User participation

Both the functional and the technical principles of the products were discussed widely in two groups - a functional study group and a technical study group - in which experts from Pica and from libraries participated.
Pica has paid much attention to user evaluation. During the demonstration phase, a user evaluation project was organized in the two testsites in order to test the functionality and the user-friendliness.



21





BEST COPY AVAILABLE

# 3 The results

***The results of the project can be grouped into four categories:***

- ***the new system***
- ***the new online catalogue***
- ***the national network of OPACs***
- ***the central gateway functions.***

## THE NEW SYSTEM

The new Pica local library system (LBS3), which was developed in the context of the OBN project provides the users with more functionality and more connectivity than the previous generation of local library systems (LBS2).

*The following major requirements for the new system were identified:*

- continuation of DEC VAX hardware
- use of DEC-supported operating system
- optimal local area connectivity within the universities
- optimal wide area connectivity with the central Pica system and other local library systems through SURFnet
- database capacity of 2 million title descriptions and 100 million index records
- performance of up to 10 transactions per second for up to 300 active users
- flexible growth path for number of users and database size
- application of standards where possible,

*The development of the new system was done in a way to allow for easy migration to Unix in the future.*

These requirements had consequences for the decisions taken in several areas. The major decisions are described in the following.

### *Operating system*

The operating system for LBS3 is VMS, the primary operating system supported by DEC for the VAX hardware.

*The major arguments for the choice of VMS were:*

- secure and robust operating environment
- good development environment



23

- good local area connectivity
- good wide area connectivity
- good third party peripherals support.

Because Unix was thought in the longer term to overcome some of its drawbacks, especially in the area of security and robustness, the development of the new system was done in a way to allow for easy migration to Unix in the future.

*Programming language and development environment*

The application development for LBS3 uses Pascal as its programming language. This is the main programming language for all application developments at Pica across all platforms.

***Major arguments to select this language were:***

- availability across many platforms
- standardization
- structured concept
- strong type-checking.

Some parts of the application, especially output producing applications are written with the use of a report generator: SQR, of SQL Solutions Benelux BV.

*The complete university network can be linked to the local library system, allowing access to the catalogue from all the stations connected.*

The development environment is enhanced through the use of DEC products for a data dictionary (DDS), a source management system (CMS), a make utility (MMS) and a special language-sensitive editor (LSE).

*Hardware and network concept*

***The hardware and network concept of LBS3 has two main elements:***

- a client-server model for internal integration of functions
- an Open Systems approach for external communication.

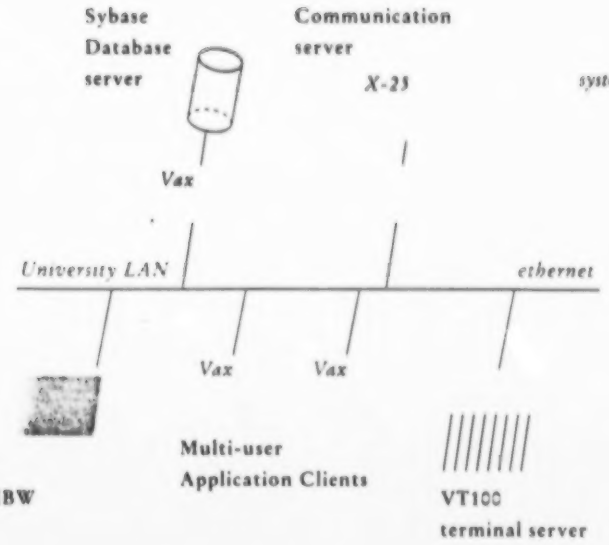



*Figure 5*
*Pica LBS: system components*

*A typical LBS3 configuration consists of:*

- a database server (microVAX-4000)
- one or more application clients (microVAX-3100) with each client servicing 40 to 60 users
- a Wide Area Network server to connect into the X.25 infrastructure of SURFnet
- MS-DOS PCs for library staff running the Pica Intelligent Bibliographic Workstation (IBW) software
- terminal servers to connect public access terminals
- a local area network (Ethernet) to connect the above mentioned components
- a connection to the university Local Area Network.

For small libraries, it is possible to combine these components in a single machine. The applications are completely unaware of the system configuration.

The choice for a client-server model was audited in the early stages of the project by S-COM.

*Communication protocols*

DECnet is used to connect the database server, the application clients and the wide area network server. Terminal servers communicate using the LAT protocol or TCP/IP. Many installations of the library PC network are based on DEC Pathworks, although it is also possible to connect PCs using TCP/IP products. Connection from Novell networks is also possible through a gateway server.


25

Through the use of a LANbridge, the complete university network can be linked to the local library system, allowing access to the catalogue from all the stations connected.

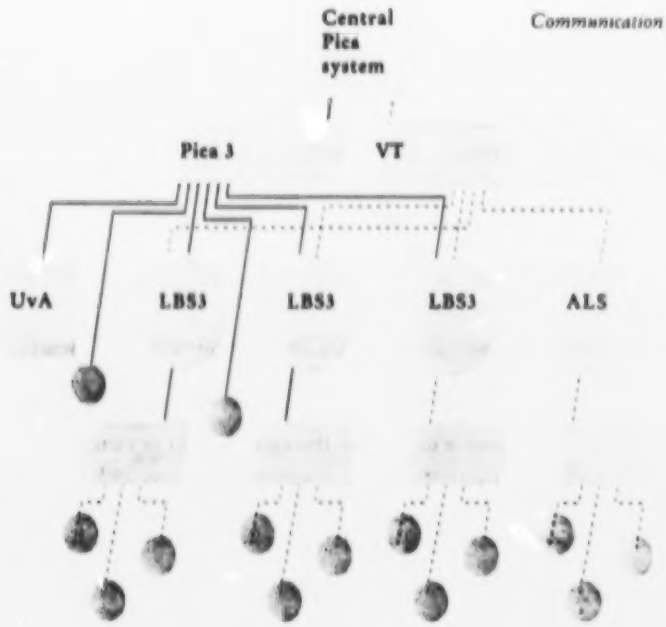
The wide area communication is based on X.25, using the DEC PSI and PSI/access products. For OSI capabilities, the system uses the DEC OSAK product to provide for transport, session and presentation layers.

*For application layer communication, two protocols are used in the local library system:*

- Pica3 for Pica application integration
- ISO Virtual Terminal for catalogue access.

Both of these are in-house Pica developments.

*Figure 6*
*Communication protocols*




All libraries will be connected to SURFnet. Larger libraries are advised to have their own dedicated 64 kbps connection. Smaller libraries can use a 9.6 kbps line.


26

*Database management system*
The database management system used in LBS3 is Sybase.

***The major arguments for selecting this product were:***
- availability across many platforms
- adequate support for the client-server model
- use of a relational model and SQL as query language
- adequate transaction integrity and recovery facilities
- adequate database capacity and performance.

*Library staff have seamless access to both the central functions and the local functions.*

In order to select the best database package available, an extensive benchmark activity was undertaken, supported by Logica. The performance and system resource utilisation of Sybase turned out to be the best of all packages that were considered.

## THE NEW ONLINE CATALOGUE

The Pica local library system is not a stand-alone system. It is a part of the wider Pica infrastructure that is being developed to provide a library network with common central facilities for cataloguing, interlibrary loan and online retrieval.

The database on the local library system is a subset selection of the central database in Leiden. In this subset, only those title descriptions appear that are actually held in the library. Central functions support shared cataloguing between the participating libraries. Local functions provide access to the library collection for endusers.

Because of this interrelation, the local system uses the same database structure, application structure and user interface that are common to all Pica systems. Library staff, who are accustomed to the interface of the central Pica functions (known as Pica3), can use the functions of the local library system in exactly the same way; for library visitors, the system looks similar to the old OPAC, but with enhanced functionality.


27

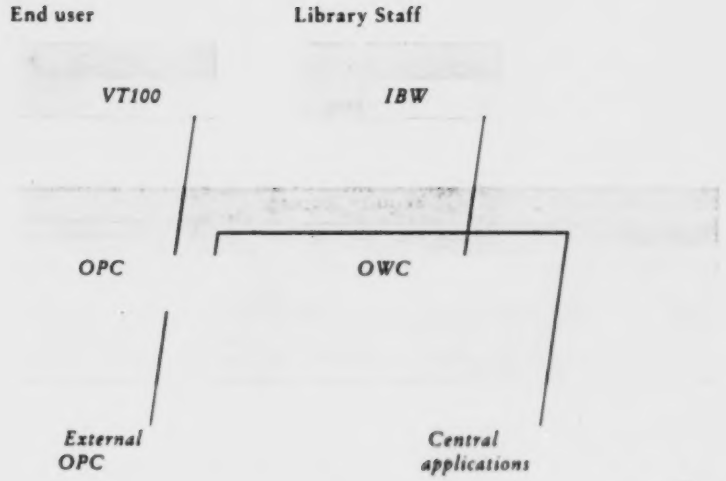



*Figure 7*
*User access*

*Online Library Access Catalogue (OWC)*

Access to the local catalogue for library staff is provided through the use of the Intelligent Bibliographic Workstation (IBW) software developed by Pica for MS-DOS PCs. This package is also used for access to the functions of the central Pica system in Leiden. The command structure is identical and all commands which are valid centrally and locally perform exactly the same function in both systems.

Library staff have seamless access to both the central functions and the local functions. The resulting functionality is referred to as 'integrated cataloguing'. This is to indicate that the user has access to two systems and two databases and can switch from one to the other at the push of a button.

*Arrangements were made for the connection of all Pica libraries to SURFnet.*

The functionality of the central and local applications is very similar. As a matter of fact, they share the same specification. This is also true for additional functions like managing user profiles and privileges. Capabilities might be somewhat different between the systems. As an example, the records in the local database are more extensively indexed than in the central system because of larger emphasis on searching in the local system.



28

*The OWC and Pica3 searching mechanism is very powerful as a result of a search command interface with many possible key types and additional facilities for:*

- selecting type of material (monographs or periodicals)
- selecting record type (catalogue entries or authority headings)
- defining search profiles
- use of boolean operators
- truncating and masking
- index browsing
- command chaining
- narrowing on year of publication and material
- searching for related records
- result set manipulation.

The presentation of database records is also very flexible allowing for several table-driven formats, such as International Standard Book Description (ISBD), one-line presentations and full diagnostic display in Pica2 format and some subset presentations such as local catalogue card and several download presentations.
As part of the OWC, a local cataloguing function is available, that can be used to build community information databases.

*Update mechanism*

Based on the experience of the previous generation of the LBS, the mechanism for downloading of records from the central to the local database has been enhanced. While previously records were transferred using magnetic tape, now electronic transfer reduces the delay caused by overnight offline tape production and regular PTT mail services. After receipt of the information, local application processes take care of the online updating of the local database.

A selection process communicates with the central system using the Pica3 protocol. It selects updates to the central database through the use of a time stamp. If updates are present that are relevant to this particular library, the records are downloaded to the local system. Any relations within these records (e.g. authority information or related title records as in the case of multi-volume publications) are also downloaded.

*Online Public Access Catalogue (OPC)*

The online public access catalogue application of LBS3 is menu-driven. The design of the user interface is such that the path through the screens is flexible: the user determines the route along which he or she wants to get to the desired results. The user interface is multilingual (Dutch, English, German).


29

To help the user to employ the system in the most efficient way, many help and suggestion facilities are built into the user interface. There are two types of help: context-sensitive help with information on the current screen, and general help giving access to all stored help information. Screens are selected through three-letter commands. Command chaining is available almost at any point. Also, functions for result set manipulation (combining, narrowing, saving) are provided.

The design of the OPC divides the functionality into two parts: the application and the presentation. Between the two parts, communication is realized through the Pica3 protocol.

*The application can be used by:*

- VT100 terminals through a presentation module on the VAX
- ISO/Virtual Terminal sessions through the same VAX presentation module
- PCs running the IBW software which already contains a presentation module.

External access from and to the OPC is provided through an ISO/Virtual Terminal implementation.

## National network of OPACs

### *Connecting the libraries through SURFnet*

Until 1990, all the libraries were connected to the central Pica system with leased PTT lines using cluster controllers to support block-mode terminal access to central functions. This star-shaped network did allow for direct communication between the library and Pica, but not for inter-library linking. Since 1987, some experimental OSI networking projects had seen some libraries connecting their local systems to SURFnet.

In preparation for the implementation of the Open Library Network, Pica and SURFnet entered a cooperation agreement in early 1990 in which arrangements were made for the connection of all Pica libraries to SURFnet. As a result, almost all of the Pica libraries have used this agreement to be connected in the course of 1990, 1991 and 1992.

All the LBS3 library systems will be connected to SURFnet. For the libraries, this connection can be used both for inter-library linking and for accessing central Pica functions; with the current volume-independent tariff structure of SURFnet, the cost of the connection is easily controlled. Furthermore, through SURFnet, worldwide connectivity is possible.



30

*ISO/Virtual Terminal development*

The connection between the OPACs on the LBS3 systems is supported through the use of an implementation of ISO/Virtual Terminal (International Standard 9040/9041). All systems implement both the VT-client for outgoing connections (called VT-active or VT-out) and the VT-server for incoming connections (called VT-passive or VT-in). The VT modules communicate over a full implementation of the OSI stack as defined by the ISO/OSI model (International Standard 7498).

The development of the Open Library Network using Virtual Terminal was a logical extension of an experimental project that was done by Pica in 1988. This project aimed at connecting LBS2 users and users of ALS systems to the functions of the central Pica system, and to provide access between LBS2 and ALS systems. This implementation of Virtual Terminal was built in a time when the International Standard was not stable. As a result, it uses a non-standard profile, called the Pica-profile, selecting only those features of the Virtual Terminal functionality that were needed at the time.

While the Open Library Network was being specified, the International standard was finally published. Also, the European Workshop on Open Systems (EWOS) which had been working on standardizing a profile for S-Mode Forms Basic Class Virtual Terminal (ENV 41 208), published the final text of the European profile. These two publications form the basis for the OBN Virtual Terminal implementation.

To allow the Open Library Network functionality to be available in both LBS2 and LBS3, the new local library system contains facilities to communicate with both profiles. This way, the catalogues of the LBS2 systems can be selected from LBS3 systems and the existence of two completely disjunct Virtual Terminal networks is avoided. This will allow libraries with an LBS2 system to be connected to the OBN functionality before they have migrated to an LBS3 system.

*Configuration and operations management*

The configuration and operations management of the network of OPACs as realized by the OBN is a delicate issue.

*The following configuration elements are to be maintained:*

- X.25 addresses (DEC PSI)
- transport and Session Access Points and internal parameters for VT (DEC OSAK)
- Presentation and Application Access Points and stack profile parameters for VT

- automatic start-up of VT-server on incoming connection request
- integrated cataloguing address parameters
- update mechanism address and timing parameters.

A menu-driven configuration tool was developed to support the operator in installing and maintaining the system.

An operator inspection tool has been developed which shows the operator what activities are going on in the online environment and what the response times for those activities are. Furthermore, for VT connections, it shows which remote system is the client for a local server or which remote system is the server for a local client.

*Statistical information*

To be able to evaluate the use of the Open Library Network, various statistical data are recorded in the local system.

*Two categories of information are relevant:*

- functional statistics, for example: who are the external users of the OPC; which databases do these users access?
- technical statistics, for example: what are the response times for the different activities; what is the load on the system and the network?

For the local processing of the statistical information, the SQR report generator is used, producing pre-defined lists. These lists are periodically uploaded to the central Pica system where an aggregate report is produced weekly.

## Central gateway functions

*The SURFnet-connection at Pica in Leiden*

As part of the agreement between Pica and SURFnet, Pica itself has also been connected to SURFnet. As the objective of the agreement was to come to a situation where all traffic between the libraries and Pica would be serviced over SURFnet, the capacity and functionality of the connection from Pica to SURFnet had to be such that the service of Pica could be maintained with a very high quality and adequate throughput.

To meet these requirements, Pica has three 64 kbps lines into SURFnet. These three lines connect Pica to each of the three main nodes in the SURFnet network in Amsterdam, Delft and Nijmegen. Special facilities have been implemented to


32

ensure fault-tolerant operation, for example a hunt-group mechanism that balances the load by automatically selecting the line with the most unused capacity.

Further fault-tolerance is provided by the installation of two network switches at Pica, connecting two separate network controllers in the fault-tolerant Tandem computer that runs the central applications.

*Technical concept central systems*

The main system at the central Pica location in Leiden is a Tandem Cyclone/R 4-processor computer with some 28 Gigabyte of storage capacity, now holding more than 9 million database records. The main role of this system is to function as a Back-End database server. The database is managed by using the Tandem relational database package ENSCRIBE together with an index engine developed in-house by Pica. The application programmes written in Pascal run under the GUARDIAN operating system.

Library staff use the system for shared cataloguing, inter-library loan and online retrieval functions. Access is from the local library integrated cataloguing facility or directly from triple-X PADs. The protocol used is Pica3 over X.25.

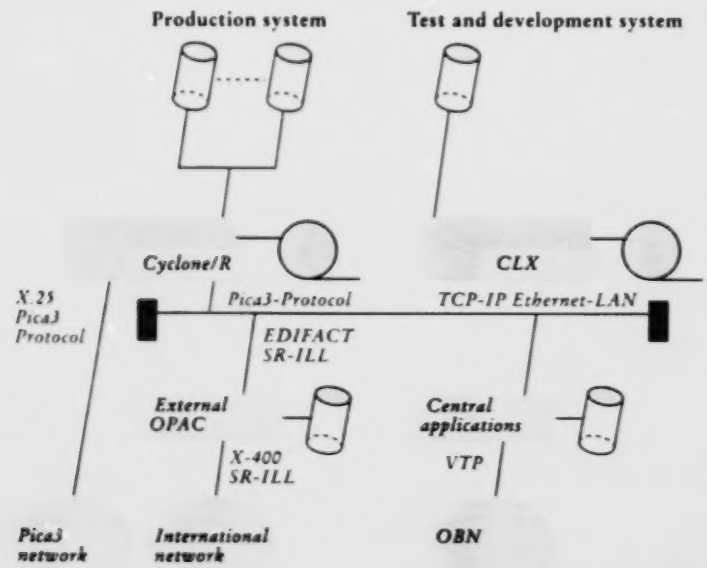



*Figure 8*
*Pica central systems, system components*


33

For other types of access requiring other protocols or additional processing of data, Front-End or Gateway machines are installed.

One VAX under Ultrix is used as the Front End for the Interlending OSI Network, a supra-national interlibrary loan network. It provides internationally standardized services for Search and Retrieve (ISO 10162/10163) in a connection-oriented mode and Inter-Library Loan (ISO 10160/10161) over X.400 to and from the Pica environment.

The second VAX is used as the central OBN Gateway and interconnects the OBN network with the central Pica system.

### *The OBN Virtual Terminal Gateway*

***The OBN Gateway running on a centrally installed microVAX offers the following functions and capabilities:***

- a common menu-driven retrieval interface based on the OPC for the files available on central database servers
- a simple request function for articles in the central online contents database or for inter-library loans
- access to OBN for users directly connected to the central system
- access to the central system from OBN and from VT100 terminals connecting over dial-up modems or PAD-facilities.

The gateway takes care of the mapping between the ISO/VT protocol used in OBN and the Pica3 protocol used by the central Tandem system. The physical connection between the Tandem and the VAX is over a LAN, based on Ethernet using TCP/IP.

User administration is done as part of the user administration facilities available on the Tandem; access privileges are controlled by requiring users to log on to the Gateway. Through this mechanism, unauthorised access will be avoided. Furthermore, protection against loops is built in, not allowing users who come in through OBN to select other OBN-destinations.

### *Mail integration*

As part of the OBN project, a connection has been installed between Picamail, the central Pica internal messaging application, and SURFmail, the electronic mail network managed by SURFnet, which also includes local mail facilities in the universities.

*The major characteristics of this connection are:*

- the existing functionality of Picamail remains unchanged for internal communication
- the new mail facility is available only for library staff, not for library users
- Picamail acts as a mailer within SURFmail
- the connection is based on the SMTP protocol using RFC822 addressing.

To send messages over SURFmail, the users of the central Pica system use a special command which presents them with an input screen where they can enter a message. The name of the person the message is sent to has the following form: 'name@domain.country'. Pica users themselves are generally registered as: 'name@picamail.pica.nl'. Pica staff are addressed as: 'name@pica.nl'.



35

# 4 *The libraries*

***OBN will have far going implications for administrative library procedures, which will be more effective. Library staff will be able to improve their work working with more speed and efficiency.***
***The task of the librarian will also change and become more enduser orientated. He will have to guide, stimulate and instruct the user on how to use OBN correctly and efficiently as well as to help out in case of problems.***

Library staff can make use of the new integrated generation of the central and local Pica systems. The improved functionality of these systems implies that library routine and the management of libraries will change.

*Library procedures can be distributed to all library departments.*

*The main issues for library staff are:*

- The availability of one workstation, based on personal computer technology: Intelligent Bibliographic Workstation (IBW). The workstation allows access to all the functions and databases of the central and local systems; furthermore, the workstation can be adopted to meet individual requirements.
- From the workstations four types of databases can be used in a fully integrated way:
  - central database (cataloguing, interlibrary loan)
  - online retrieval databases
  - online library access catalogue (OWC)
  - other online public access catalogues.
- Entered data can be stored immediately in the different databases via the online updatemechanism.
- All systems are accessible via a common userinterface. This means that there is one general command language. For specific applications, extra commands can be used.
- It is possible to switch quickly from one procedure to another.
- Library procedures can be distributed to all library departments, also because of the connectivity from all office-desks.
- Electronic mail facilities are introduced not just for users of Pica systems (Picamail), but for external use (SURFmail) too.
- Decentralized branches of libraries can work with each other on an integrated basis, too.

BEST COPY AVAILABLE

# 5 The library user

***With technical advanced network services, OBN will set the library user in the centre of library services. Seamless access will be created to catalogues and databases of the own library and of other libraries. In the near future, those facilites will be improved, based on user evaluation. Furthermore, the introduction of new services has been planned.***

## OBN-PRODUCTS FOR THE LIBRARY USERS

*After full implementation of OBN, the library user will have the following facilities:*

- searching through the user's own library catalogues and files
- borrowing, reserving and renewing the loan of publications from the own library
- searching through catalogues and files belonging to other libraries participating in OBN
- requesting publications from these other libraries' stock
- searching through Pica's central online retrieval databases
- printing and downloading of information, resulting from the abovementioned operations.

*In due course, three additional facilities will be realized:*

- searching in Pica's National Union Catalogue
- requesting publications via the National Union Catalogue
- electronic delivery of documents.

This way, the library user will have access from his own office-desk to a wealth of information, independent of a library.

## OBN-ORGANIZATION

In order to serve the library user with OBN-products effectively, the cooperating participating libraries had to reorganize their services. In 1991, the university librarians of Pica published a report, entitled: 'The Applications of the Open Library Network in the Dutch Libraries'.


39

*Issues mentioned are:*

- **Authorization and identification of the user**
  The libraries of Pica want the library services on offer to be differentiated in such a manner that they will be accessible to different categories of users with different levels of autorization.
  Each library is responsible for authorizing its own end-users. At the same time this level of autorization, assigned decentrally, gives each library the opportunity to determine its own policy towards its users.
- **Different kinds of users**
  The distinction between university and non-university user groups plays an important role in developing policies further. The university libraries want to create as uniform a line of conduct as possible towards the kinds of services to be set up and towards establishing priorities for these groups. Also the consequences of the services, including the financial ones, should not differ much. The libraries aim at differentiating the different groups of users in a uniform manner, within the framework of agreements about a mutual charging of costs towards interlibrary lending.
- **Registered and non-registered users**
  In the OBN report a distinction was made between registered and non-registered users. Non-registered users use a work station to seek a connection with an OBN library without being able or willing to identify themselves. To this group only reference facilities will be given.
  Registered users have been authorized by an OBN library and provided with a membership card. A user is registered in OBN when he has given his membership number at the system's request and when this member has been validated by the system. The user is always identified by his own local library system and never by an external system.
- **Cooperation**
  While implementing OBN, attention will have to be paid to special forms of cooperation of all different kinds of libraries. Several types of libraries (academic, public, industrial, departmental, government, etc.) and cooperation circuits which in recent years have been developed either thematically (bio-medical, technical circuit) or locally, regionally, nationally or internationally, will also be taken into account.
- **Charging the libraries and the users**
  The Pica-libraries consider mutual charging of mutual services to be an important management mechanism. Within the framework of further development of OBN, decisions will have to be made about the development, introduction and implementation of the method of charging. Recently, such a method has been developed and discussed by the libraries concerned. Implementation can be expected at the end of 1992.



40

How far a library will subsequently charge these services directly to the end-users depends on the local situation (policy agreements, the library's financial allocation model etc.). It is important, however, that in this respect, too, national uniform rates are used as much as possible.

*OBN is organized in such a way that library users are served efficiently.*

## OBN ORGANIZATIONAL STRUCTURE

After implementation of OBN, the delivery of services to library users has to be structured in a cost-effective way.

*One can differentiate between:*
- different types of libraries: Royal Library, university libraries, WSF-libraries, etc.
- thematical groups of libraries: for example technical or bio-medical libraries
- geographically organized groups of libraries: for example ROBIN, ADAMnet, IHOL, Provincial Public Library organizations.

*In order to realize cost-effective management, OBN is organized in such a way that library users are served efficiently:*
- firstly, the library user will be served by his own library
- secondly, when this library cannot fulfil the requirements, the library user will be served by the libraries within his 'virtual region', that is geographically (the libraries in the region) or professionally (the libraries within his professional research field)
- finally, when the results are still failing, the library user will be served at a national level, which includes connections to international library services.

## USER EVALUATION

During the OBN project, the new Online Public Access Catalogue (OPC3) was evaluated in a large scale study by the Royal Library and the University Library Groningen. While earlier OPC-evaluations had concentrated on data collection by means of user interviews, this study focused on the user interface by means of observation. To that end the effectiveness and efficiency of search strategies were analysed on the basis of controlled experiments with 200 test persons.

In the evaluation a rich variety of quality criteria was used, ranging from pre-established user expectation and cybernetical quality to the cognitive



41

capacities of the system. Moreover, further practical implementational development suggestions were aimed at.
The overall results can be judged as positive; especially the speed of presenting results, and the screen layout of the system were reported as strong points of OPC3. Of course some weaknesses were stressed as well. Quite a number of findings were reported which pointed at unexpected user behaviour as well as at lacks in the user-friendliness and functionality of the system.

*Of all those findings the following conclusions can be mentioned:*

- The number of search steps and the fast presentation of search results were judged positively.

| *system efficiency is good* | *experienced OPC3 user (n = 77)* | *inexperienced OPC3 user (n = 123)* | *total* |
|---|---|---|---|
| *yes* | *64%* | *85%* | *77%* |
| *no opinion* | *15%* | *9%* | *11%* |
| *no* | *21%* | *6%* | *12%* |
| | *100%* | *100%* | *100%* |

- The OPC3-screen layouts were judged positively. However, because users sometimes tend to read badly and they seem to need as much help as possible, it was suggested to review screens.

| *search screen lay-out is good (n = 200)* | *experienced OPC3 user (n = 77)* | *inexperienced OPC3 user (n = 123)* | *total* |
|---|---|---|---|
| *yes* | *82%* | *72%* | *76%* |
| *partly* | *15%* | *21%* | *19%* |
| *no* | *3%* | *7%* | *5%* |
| | *100%* | *100%* | *100%* |

| *short presentation: screen lay-out is good (n = 200)* | *experienced OPC3 user (n = 77)* | *inexperienced OPC3 user (n = 123)* | *total* |
|---|---|---|---|
| *yes* | *73%* | *58%* | *64%* |
| *partly* | *24%* | *36%* | *31%* |
| *no* | *3%* | *6%* | *5%* |
| | *100%* | *100%* | *100%* |



42

| *full presentation: screen lay-out is good* | *experienced OPC3 user (n = 77)* | *inexperienced OPC3 user (n = 123)* | *total* |
|---|---|---|---|
| *yes* | *84%* | *76%* | *79%* |
| *partly* | *13%* | *20%* | *17%* |
| *no* | *3%* | *4%* | *4%* |
| | *100%* | *100%* | *100%* |

- Too many searches were broken off by the test persons and had to be started again; this was blamed to lack of experience and lack of orientation and control as a consequence.

| *the offered search possibility is clear; experienced OPC3 users (n = 77)* | *ZOE (search)* | *SEL (select)* | *GRO (enlarge)* | *KLE (reduce)* |
|---|---|---|---|---|
| *yes* | *81%* | *65%* | *68%* | *80%* |
| *partly* | *4%* | *6%* | *9%* | *6%* |
| *no* | *15%* | *29%* | *23%* | *14%* |
| | *100%* | *100%* | *100%* | *100%* |

| *the offered search possibility is clear; inexperienced OPC3 users (n = 123)* | *ZOE (search)* | *SEL (select)* | *GRO (enlarge)* | *KLE (reduce)* |
|---|---|---|---|---|
| *yes* | *54%* | *54%* | *62%* | *79%* |
| *partly* | *4%* | *10%* | *6%* | *3%* |
| *no* | *42%* | *36%* | *32%* | *18%* |
| | *100%* | *100%* | *100%* | *100%* |

- As a consequence of as yet insufficient documentation, a number of OPC-commands was under-used, or used wrongly.
- While end-users perceived OPC3 as a tool in reaching a goal, they showed rather little motivation for studying the various operational possibilities of the system.
- Furthermore, a considerable amount of suggestions were made, varying from a more transparent way of scrolling to suggestions for alternative screen texts.

Based on the user evaluation report, Pica will implement an improved version of the OPC.

BEST COPY AVAILABLE

# 6 *The future*

***The main purpose of the OBN concept is to maximize integration of existing automated library systems, networks and procedures. The first phase of the OBN project has now been realized. For the near future, the OBN concept will be further developed, implemented in libraries and improved with new services and products.***

## TECHNICAL DEVELOPMENTS

*The next phase of developments will include:*

- improvement of the OPC, based on the results of user evaluation
- development of facilities to improve borrowing and for renewal of loan of publications from the office-desk in the own library
- development of loan facilities from other libraries participating in OBN individually
- development of search facilities in the National Union Catalogue
- development of interlibrary loan facilities without any distinction between libraries.

## IMPLEMENTATION

Further implementation of OBN is planned for the next few years. During the project, OBN was implemented on the testsites, the Royal Library and the University Library Groningen. During 1992-1993, all the other existing Pica LBS2 systems, installed in 18 libraries, will be converted to LBS3, which includes the implementation of OBN-facilities. In 1992, Pica has started the PAL project in cooperation with Automated Library Systems (ALS) in order to connect the ALS-systems for public libraries to OBN. Realization will have a positive influence on the establishment of regional networks in Rotterdam (ROBIN), Overijssel, Zuid-Holland and Noord-Holland.
In Amsterdam, there is an extreme multi-vendor library system situation (Pica, GEAC, CLSI, IBM, etc.). Therefore, Amsterdam libraries decided to cooperate in Adamnet in order to establish a regional network. After it had started, Adamnet and Pica agreed to study on the further development of Adamnet into a regional network of OBN.
Further implementations will be planned in the near future.


45

## NEW PRODUCTS AND SERVICES

In 1991 the Pica Board accepted a project plan for electronic document delivery. The project, now known as RAPDOC, will be supported financially by the Ministry of Education and Science. RAPDOC can be regarded as a logical consequence of OBN and as its complementary. It will be executed by Pica in cooperation with 19 major libraries in the Netherlands (mainly research libraries, but also some public libraries). Together they aim at the delivery of requested articles from 7,000 scientific periodicals within 24 hours.

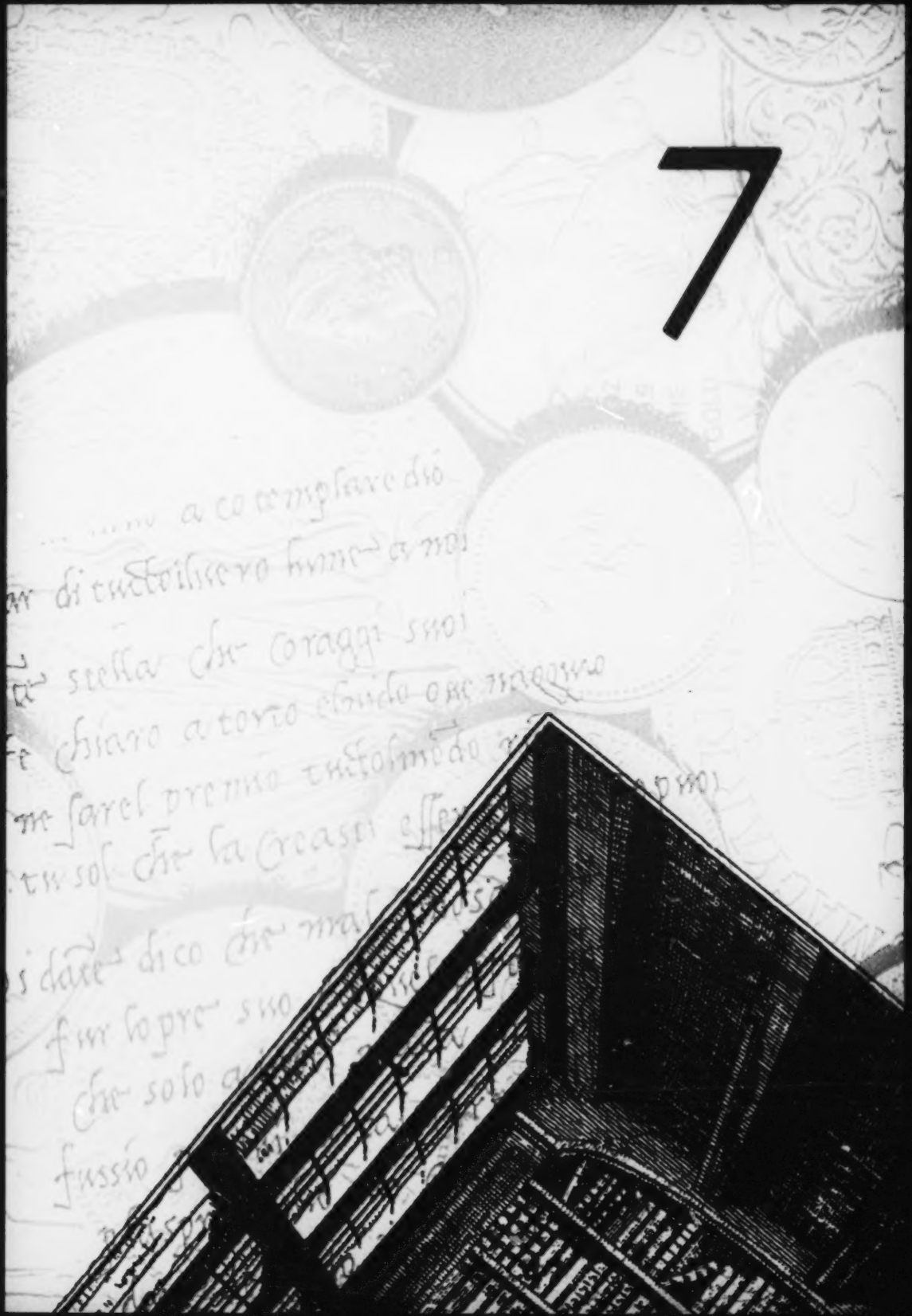
*The main clusters of activities in the context of this project will be:*

- **Organizational:** After having made further and deeper analyses of the availability of the 7,000 titles ('Core collection'), their distribution over the Dutch libraries, and the requests being made to them, the participating libraries will give guarantees for rapid delivery of certain quota of requests. Various existing organizational and technical infrastructures will be improved.
- By adding **table of contents data** to the database of the 'distributed core collection' of periodical titles, a vast amount of bibliographic article information will be made available. Swets & Zeitlinger, subscription agents, will supply an estimated 630,000 citations per annum in machine-readable form, starting September 1992. Pica will load these data on its central database, on which they will be operationally available from the beginning of 1993. Relevant subsets of the thus created central database of bibliographical periodical articles information will be distributed from the central system to local library systems (OPAC's, LAN's).
- Extra **telecommunication facilities** through Pica- and SURFnet-networks.
  A number of alterations to the existing ILL software has to be brought about, thus implementing a technical infrastructure which will enable the transmission of documents in electronic form directly, towards both libraries and end-users. Documents (periodical articles) will be scanned, compressed and stored temporarily on workstations (pc's) in the supplying libraries (local level). Overnight, the documents will be transferred to workstations in the receiving libraries, over the X.25 SURFnet-network.

All activities described, should - within the next 2-3 years - establish a system for fast mutual document delivery, intended to fulfil the demands of the various user groups of the participating libraries. In the case of a successful operation, the possibilities of offering the document delivery services to user groups outside the circles of the current participants will be studied.
SURFnet has initiated a research project in which, as an extension of RAPDOC objectives, the possibilities of full image storage are studied.


46

# 7



# 7 Finances

The OBN-project was subsidized by SURF Foundation, that for its part received subsidies from the Ministeries of Education and Science, Economic Affairs and Agriculture.
The financial settlement between Pica and SURFnet was based on the principle of subsequent calculation: Pica credits SURFnet for its real costs. The project budget was the upper limit for crediting. Exceeding costs were at the expense of Pica. Personnel costs were based on the actual work performed.

The grand total of project-costs is f 3.825.752,- (incl. V.A.T.). Of these costs, SURFnet paid f 3.228.483,- and Pica f 597.269,-.

The budget was subdivided into a number of smaller budgets for every activity. It was possible to change within the subdivision after approval by SURFnet. The financial overviews and the documents on which they were based were subject to auditing by an accountancy company on behalf of the SURF Foundation.

The project appeared to be even more complex than was foreseen. Personel costs were exceeded with f 291.255,- partly based on an underestimation of project-management, general design and implementation. Also, Pica decided to ask an independent company for auditing the overall technical design, a post that had not been budgetted.

As for the participation in the OBN-project as a test site, for the duration of the project a testing configuration was made available to the University Library Groningen.

## TOTAL VIEW OF COSTS

| | | BUDGET according to the Project Plan | | Realization Design Phase (Jan.-Aug. 1990) | | Realization Development Phase (Aug. '90-Feb. '91) | |
|---|---|---|---|---|---|---|---|
| | | *days* | *costs* | *days* | *costs* | *days* | *costs* |
| Project planning | 1 | *20* | 15.200 | *10* | 7.900 | *3* | 4.125 |
| Project management | 2 | *146* | 233.600 | *86* | 67.940 | *71* | 56.650 |
| Audit | 3 | | 0 | *3* | 10.000 | *31* | 48.877 |
| Documentation; instruction | 4 | *100* | 90.000 | *65* | 46.330 | *18* | 14.430 |
| General design | 5 | *100* | 90.000 | *198* | 167.200 | | 0 |
| Design VT protocol | 6 | *25* | 22.500 | *10* | 9.370 | *20* | 15.800 |
| Design screen update | 7 | *75* | 67.500 | *52* | 42.550 | | 0 |
| Design WAN | 8 | *75* | 67.500 | *25* | 19.750 | | 0 |
| Performance tuning | 9 | *100* | 90.000 | *83* | 93.642 | *25* | 37.467 |
| Development OPAC | 10 | *800* | 720.000 | | 0 | *870* | 765.645 |
| Development VT phase 1 | 11 | *200* | 180.000 | | 0 | *118* | 99.215 |
| Development VT phase 2 | 12 | *50* | 45.000 | | 0 | | 0 |
| Development testing tools | 13 | *125* | 112.500 | | 0 | *3* | 2.370 |
| Mail integration | 14 | *120* | 127.136 | *10* | 7.900 | *50* | 40.410 |
| Implementation | 15 | *350* | 315.000 | *3* | 2.370 | *13* | 10.585 |
| On site activ.; evaluation | 16 | *100* | 90.000 | | 0 | *0* | 0 |
| Total personnel costs Pica | 17 | *2.386* | 2.265.936 | *327* | 474.952 | *1.224* | 1.095.574 |
| Of which accepted by SURFnet | 18 | | 2.265.936 | | 332.900 | | 1.095.574 |
| Education | 19 | | 80.169 | | 16.438 | | 22.500 |
| Development configuration | 20 | | 337.553 | | 360.330 | | -1.733 |
| Test site configuration | 21 | | 316.456 | | 0 | | 0 |
| VT software | 22 | | 28.672 | | 0 | | 7.941 |
| Total material costs PICA | 23 | | 762.850 | | 376.768 | | 28.708 |
| Of which accepted by SURFnet | 24 | | 762.850 | | 370.330 | | 28.708 |
| Project control by SURFnet | 25 | | 113.297 | | 16.645 | | 54.779 |
| External costs SURFnet | 26 | | 86.400 | | 50.438 | | 5.625 |
| Total costs SURFnet | 27 | | 199.697 | | 67.083 | | 60.404 |
| GRAND TOTAL ACCEPTED COSTS | 28 | | 3.228.483 | | 770.313 | | 1.184.686 |
| V.A.T. 18,5 % | 29 | | 597.269 | | | | |
| GRAND TOTAL INCL.V.A.T. | 30 | | 3.825.752 | | | | |

| Realization Implement. Phase (Feb.-Dec. 1991) | | Realization Demonstration Ph (Dec. '91-July '92) | | Total Realization | | Budget minus Realization | |
|---|---|---|---|---|---|---|---|
| *days* | *costs* | *days* | *costs* | *days* | *costs* | *days* | *costs* |
| *3* | 2.475 | | 0 | *18* | 14.500 | *2* | 700 |
| *110* | 90.750 | *41* | 33.825 | *308* | 249.165 | *-162* | -15.565 |
| | 0 | | 0 | *36* | 58.877 | *-36* | -58.877 |
| *10* | 8.250 | *3* | 2.475 | *76* | 71.485 | *24* | 18.515 |
| *47* | 38.775 | | 0 | *245* | 205.975 | *-145* | -115.975 |
| | 0 | | 0 | *30* | 25.170 | *-5* | -2.670 |
| | 0 | | 0 | *52* | 42.550 | *23* | 24.950 |
| | 0 | | 0 | *25* | 19.750 | *50* | 47.750 |
| *10* | 8.250 | | 0 | *118* | 139.359 | *-18* | -49.359 |
| | 0 | | 0 | *870* | 765.645 | *-70* | -45.645 |
| *168* | 138.600 | | 0 | *286* | 237.815 | *-86* | -57.815 |
| | 0 | *104* | 85.800 | *104* | 85.800 | *-54* | -40.800 |
| *29* | 23.925 | | 0 | *32* | 26.295 | *93* | 86.205 |
| *26* | 21.450 | *11* | 9.075 | *97* | 78.835 | *23* | 48.301 |
| *480* | 435.290 | *33* | 27.225 | *529* | 475.470 | *-179* | -160.470 |
| *55* | 45.375 | *5* | 15.125 | *60* | 60.500 | *40* | 29.500 |
| *938* | 813.140 | *197* | 173.525 | *2.886* | 2.557.191 | *-500* | -291.255 |
| | 689.390 | | 173.525 | | 2.291.389 | | -25.453 |
| | 10.700 | | 26.231 | | 75.869 | | 4.300 |
| | 0 | | 0 | | 358.597 | | -21.044 |
| | 317.714 | | 0 | | 317.714 | | -1.258 |
| | 4.209 | | 0 | | 12.150 | | 16.522 |
| | 332.623 | | 26.231 | | 764.330 | | -1.480 |
| | 332.623 | | 26.231 | | 757.892 | | 4.958 |
| | 34.470 | | 8.676 | | 114.569 | | -1.273 |
| | 11.175 | | 8.025 | | 75.263 | | 11.137 |
| | 45.645 | | 16.701 | | 189.832 | | 9.864 |
| | 1.067.658 | | 216.457 | | 3.239.113 | | -10.631 |

# *Abbreviations*

| | | |
|---|---|---|
| IBW | - | Intelligent Bibliographic Workstation |
| ILL | - | Interlibrary Loan |
| ISO | - | International Organization for Standardization |
| LAN | - | Local Area Network |
| LBS | - | Local Library System (Lokaal Bibliotheek Systeem) |
| OBN | - | Open Library Network (Open Bibliotheek Netwerk) |
| OP(A)C | - | Online Public (Access) Catalogue (Online Publiekscatalogus) |
| OSI | - | Open Systems Interconnection |
| OWC | - | Online Library Access Catalogue (Online Werkcatalogus) |
| RAPDOC | - | Pica Project for Rapid Document Delivery |
| RDBMS | - | Relational Database Management Systems |
| TCP/IP | - | Transmission Control Protocol / Intermission Protocol |
| VT | - | Virtual Terminal |
| WAN | - | Wide Area Network |

BEST COPY AVAILABLE